

Arc Flash Specification

1.01 OBJECTIVE

- A. The purpose of this project is to provide a complete arc flash program for **XYZ Company** to help protect individuals working on its premises from electrical arc flash hazards. These individuals may include any workers who inspect, maintain or operate energized electrical equipment.
- B. The program shall help bring **XYZ Company** into compliance with the applicable standards for new installations (NEC) and for worker safety in operating facilities (OSHA 29 CFR 1910, NFPA 70E-2009).
- C. The program shall assist **XYZ Company** with improving the reliable operation of the electrical system by providing a short circuit and protective device coordination analysis.

1.02 PROJECT SCOPE

A. System Data

The supplier shall provide an up to date electrical system single-line diagram as required by NFPA 70E, 2009 Edition, "Standard for Electrical Safety in the Workplace", as referenced in OSHA 29 CFR 1910 Subpart S, Appendix A. This information shall include nameplate data for electrical components (e.g. transformers, medium voltage switchgear, panelboards, switchboards, motor control centers, etc.) for all portions of the electrical system analyzed -- from the utility supply through the lowest rated panel in accordance with IEEE 1584.

Cable sizes, types and lengths between electrical equipment components and up to date utility source data shall be provided for an accurate single-line representation of the electrical system. Unique characteristics of the equipment installation shall be provided which may impact the magnitude of the potential hazard (e.g. open space versus enclosure). Overcurrent device settings shall be verified.

XYZ Company will remove covers and open panels as necessary to provide access for supplier to obtain equipment data. The supplier must provide proof (written documentation) that its employees working on the premises of **XYZ Company** have been properly trained in the use and application of personal protective equipment (PPE) and the hazards of working on or near energized equipment. The supplier must provide its own PPE protection.

B. System Analysis

A comprehensive analysis of **XYZ Company's** electrical system shall be performed for all equipment 480 volt and higher, and for all equipment rated less than 240 volts if it is served by a 125kVA or larger transformer. This analysis shall include the following:

1. Short Circuit Study – A short circuit analysis shall be performed in accordance with ANSI standard C37 and IEEE standard 141-1993 (Red Book) for each electrical component as defined in "Section A."
2. Coordination Study – A coordination study shall be performed in accordance with IEEE 242-2001 "Buff" to determine the proper overcurrent device settings that will balance system reliability through selective coordination while minimizing the magnitude of an electrical arc flash hazard incident.
3. Incident Energy Study – An incident energy study shall be done in accordance with the IEEE 1584-2004a, "IEEE Guide for Performing Arc Flash Hazard Calculations" as referenced in NFPA 70, "Standard for Electrical Safety in the Workplace", 2008 Revision, in order to quantify the hazard for selection of personal protective equipment (PPE). Simply using the table values from NFPA 70E and assuming fault current levels and clearing times for proper PPE selection is not acceptable. The supplier shall assist **XYZ Company** in selecting appropriate combinations of PPE prior to the final analysis and preparation of equipment labels.
4. (Optional) Low Energy Equipment – If requested by **XYZ Company**, the scope of the analysis and labeling project may be extended at additional cost to include all equipment rated above 50 volts.

C. Design Review

The supplier shall assist **XYZ Company** with system design adjustments to optimize the results of the study as it relates to safety and reliable electrical system operation (e.g. overcurrent device settings, working distances, current limiting devices). This includes mitigation, where possible, of incident energy levels that exceed 40 calories/cm². A qualified engineer with power systems design experience shall provide this assistance.

D. Study Report

The supplier shall supply a comprehensive report that includes:

- Report summary with analysis methodology, findings and recommendations
- Summary of input data for utility source, equipment and cables
- Available fault current at each equipment location with comparison to equipment rating
- Overcurrent device settings (e.g. pick-up, time delay, curve), "as found" and "as recommended"
- Incident energy level (calories/cm²) for each equipment location and recommended PPE
- Overcurrent device coordination curves including related section of the single-line diagram
- Complete system single-line diagram for the system analyzed

E. Labels

Based on the results of the incident energy study, the supplier shall produce and install danger labels for each piece of equipment as specified in Paragraphs 1., 2. and 3. of Section B above, in accordance with ANSI Z535.4-2002. (Optional – If requested by **XYZ Company**, the supplier shall produce and install appropriate danger labels for each piece of equipment as specified in Paragraph 4. of Section B above, in accordance with ANSI Z535.4-2002.) The labels must be readable in both indoor and outdoor environments for at least 3 years and contain the following information as appropriate:

- Arc hazard boundary (inches)
- Working distance (inches)
- Arc flash incident energy at the working distance (calories/ cm²)
- PPE category and description including the glove rating
- Voltage rating of the equipment
- Limited approach distance (inches)
- Restricted approach distance (inches)
- Prohibited approach distance (inches)
- Equipment/bus name
- Date prepared
- Supplier name and address

F. Equipment Verification/Operation

The validity of the arc flash study and incident energy readings is in part based on proper setting of overcurrent device trip times and the proper operation of the overcurrent devices and breakers themselves. The supplier shall verify proper operation of overcurrent devices and breakers at the request of **XYZ Company** using InterNational Electrical Testing Association (NETA) qualified technicians.

The supplier shall be capable of adjustment, maintenance, repair or replacement of overcurrent devices or breakers as required to support the performance of the electrical system in line with the expectations of the system study.

G. Safety Training

The supplier shall provide **XYZ Company** one day of arc flash safety training that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E. This shall include:

- Proper use of the system analysis data
- Interpretation of hazard labels
- Selection and utilization of personal protective equipment
- Safe work practices and procedures

The supplier shall provide **XYZ Company** an outline of the one day training course including training materials at time of quotation. **XYZ Company** at its discretion may require a needs assessment and/or additional training customized to its specific needs. The supplier shall be capable of developing and presenting customized training for approval as required.

The supplier shall provide a training certificate to record satisfactory completion by **XYZ Company** employees for continuing education credits and re-licensing requirements. Satisfactory completion is defined as the student obtaining a minimum of 70% on the post training examination and the ability to work safely if a hands on performance evaluation is provided.

H. Safety Documentation/Policy

At the request of **XYZ Company**, the supplier shall integrate the results of the system study and design review into the safety manual of **XYZ Company** in compliance with OSHA CFR 29 1910.333. The supplier shall assist **XYZ Company** at its request to develop a safety policy with corresponding documentation and procedures including information gained in the system analysis. This includes electrical safety, procedures for mitigation of arc hazards, PPE selection based on specific equipment of **XYZ Company**, task and training requirements.

1.03 QUALITY ASSURANCE

- A. The supplier shall provide all necessary material, equipment, labor, and technical supervision to perform the arc flash hazard analysis as described herein.
- B. The supplier shall utilize engineers and technicians that are experienced and regularly perform electrical power system testing.
- C. Personnel performing the arc flash analysis shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tasks of the analysis in a safe manner and with complete knowledge of the hazards involved.

1.04 SAFETY AND PROCEDURAL REQUIREMENTS

- A. The supplier must provide proof (written documentation) that its employees working on the premises of **XYZ Company** have been properly trained in the use and application of personal protective equipment (PPE) and the hazards of working on or near energized equipment. The supplier must provide its own PPE.
- B. Safety practices that shall be followed include, but are not limited to, the following:
 - Occupational Safety and Health Act
 - *Accident Prevention Manual for Industrial Operations*, National Safety Council
 - Applicable state and local safety operating procedures
 - Owner's safety practices
- C. Perform all work in accordance with the applicable codes and standards of the following agencies except as provided otherwise herein:
 - 1. InterNational Electrical Testing Association – NETA ATS latest Edition: Acceptance Testing Specifications, and/or NETA MTS latest Edition: Maintenance Testing Specifications.
 - 2. National Fire Protection Association – NFPA
 - a. ANSI/NFPA 70: National Electrical Code
 - b. ANSI/NFPA 70B: Recommended Practice for Electrical Equipment Maintenance
 - c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces